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PARADIGMS OF BELIEF, THEORY AND METATHEORY

by Roger W. Sperry

Abstract. My account of the recent turnabout in the treatment of mental states in science and its basis in a modified concept of causal determinism and my claim that this opens the way for beliefs and values consistent with science are here reaffirmed in response to perceived weaknesses and "inherent incompleteness." Contested issues are reviewed to better clarify the main thesis. An inherent weakness in respect to deep spiritual needs is recognized and tentative remedial measures explored.

Keywords: emergent causation; metatheory; mind-brain relation; paradigm levels; religion and science.

After reading James Jones's analytic appraisal (27/2, June 1992) of my recent *Zygon* article on beliefs to live by consistent with science (Sperry 1991a) my first reaction was that I had done it again; failed, that is, to adequately describe my heterodox "mentalist" blend of previously opposed philosophies in a manner not open to gross misinterpretation. Ever since my changeover in the mid-sixties to *An Alternative Mentalist Position* (Sperry 1965), the new mental or "macromental" view (which I continue to support in full) has been widely criticized, due in large part to misinterpretation (Natsoulas 1987; Ripley 1984). In the present case, my subject and general approach were not conducive to detailed philosophic definitions or epistemic distinctions and may leave this particular account, more than usual perhaps, open to misinterpretation.

The main criticisms raised by Jones can be shown, I think, to fall into the above category. The issues involved, however, and their potential bearing are such that it seems important to try to clarify

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any possible confusion or misconceptions. In any case I would like to thank Dr. Jones for his concern, considerable positive assessment, and for bringing forth some of the difficulties he finds along with suggestions for an improved approach.

Dualism in Neuroscience

My described shift from behaviorism to a new mentalist paradigm is commonly misinterpreted to be a shift to dualism (see Bindra 1970; Bunge 1980; Natsoulas 1987; Ripley 1984; Sperry 1981). Jones appears to be making this mistake when he lumps me at the outset with other neuroscientists who, late in their careers, relinquished an earlier reductionist approach and "became convinced dualists." However, Jones seems to be just loosely contrasting dualism here against reductionism, although historically, dualists or monists may either favor or oppose reductionism. Specialist readers may see through intricacies of this sort and emerge with correct interpretations, but many others are bound to be left with erroneous impressions from this and other of Jones's introductory statements.

Karl Lashley, for example, neither abandoned the reductive approach nor turned to dualism. To account for his path-breaking findings that the engrams of memory are distributed, not localized, Lashley proposed his "reduplicated wave interference pattern" hypothesis, which was very much in the reductionistic monist tradition and a 1940s precursor of today's hologram models of brain function.

It will be pertinent for my coming argument to note some further misleading impressions conveyed in Jones's introduction. For example, the eminent neurophysiologist, John Eccles, to whose opinion Jones later turns, did not shift to dualism *after* (or *as a consequence of*) studying neurology—nor because of any scientific findings. Eccles already was a strongly confirmed dualist since about age eighteen for quite different, nonscientific reasons. In the early fifties Eccles was proposing that mind may influence brain through microevents in neuronal synaptic junctions (Eccles 1953), but he no longer pushed this concept during the next few decades (Eccles 1966). Eccles's recent more impassioned campaign for dualism launched in the 1970s also was not prompted directly by scientific findings, but rather by his discovery of the same mentalist logic for the mind-brain relation to which I had switched in the mid-sixties. "Emergent interactionism" became "psychophysical interactionism" (Popper and Eccles 1977, 373) and was combined with other ideas to give a new strength to his longtime dualistic position.

Wilder Penfield, the distinguished neurosurgeon and author whose work and interpretations Jones also relies on to support his case, is similarly depicted erroneously as having turned to dualism "as the consequence of [his] findings" (Jones 1992, 191). Penfield, in his eighties, at the end of his final book (Penfield 1975), was moved to express a personal leaning in favor of a dualistic (or at least a "two-element") view of the human self. In doing so he made clear, however, that the scientific findings on the mind-brain issue are not yet decisive. The findings, he stated, leave a choice between "two hypotheses: (a) that man's being consists of one fundamental element, and (b) that it consists of two" (114), explaining that a choice between the two cannot be made on the basis of the existing evidence. Rather, "it behooves each one of us," he wrote, "to adopt for himself a personal assumption (belief, religion), and a way of life without waiting for a final word from science" (115).

Several times in his book Penfield reminds his readers that throughout his active investigative career he worked on the assumption that brain and mind are one and the same: "let me state again that, working as a scientist all through my life, I have proceeded on the one element hypothesis . . . that activities of the highest [brain] centers and mental states are one and the same thing, or are different sides of the same thing" (Penfield 1975, 114).

What moved Penfield to shift later to the "two element" view was not any "findings," but rather his personal reasoning and reflections about some remaining unknowns; for example, about what happens when "the mind vanishes" (as after a blow on the head, in types of brain injury, during an epileptic seizure—or just naturally as in deep sleep). To account for a continuing existence of the mind during such periods, Penfield reasoned that the mind has to be different from the (temporarily silenced) highest brain centers. Penfield denied that the mind has memories of its own, locating these in the brain itself which "like a computer . . . stores its records" (82) in a form available to the conscious mind. He also uses italics to emphasize his concept of the mind as "*a semi-independent element*" (82), and states further, "I do not like the phrase 'immaterial agency'" (103).

Thus, in the main, Penfield seems to affirm a view of mind that does not involve an independent existence apart from the brain. "The mind is attached to the action of a certain mechanism within the brain" (85). Indeed much of his "two element" description could be interpreted as applicable to the current new mentalist doctrine, which similarly recognizes that the emergent subjective element is "different from, and more than" (but inseparable from) the physiological element. When Penfield expressed his shift to the

two-element view, the new mentalist interpretation had already become widespread in the literature as the dominant working mainstream doctrine in behavioral science.

In reference to Jones's treatment of Penfield's findings as being "crucial" and unexplainable in neuroscientific terms, it is important to remember that throughout Penfield's active career, neither he nor his associates (or most neuroscientists of the period) considered any of these findings to be something that demands or even favors a dualistic interpretation. This applies as well to the reception in neuroscience today of the experiments of Libet and Kornhuber selected also as being "crucial."

THEORY OR METATHEORY?

The approach of this critique as a whole is misleading in other ways that also collectively indicate a basic misinterpretation. It was never my intent, for example, to suggest that "neuroscience alone" can provide "a complete account of human nature," nor to advocate a "unification" of science and religion. I tried, rather, to explain that the new outlook in science is founded on a modified concept of causal determinism that provides not only "mental" causation, but also nonreductive "macro" causation throughout nature and thus opens a revised scientific view of reality that does not exclude contributions from the humanities. The world of science and that of the humanities, previously separated by the use of mutually incompatible explanatory frameworks (W. Jones 1965), now become joined in a consistent and unbroken epistemologic continuum.

Also, I purposely avoided in my title and elsewhere terms such as *based on* or *based in* science, using the phrase *consistent with* instead. I did this to assure that facts and knowledge from nonscientific sources qualify as part of this continuum (including abstract inferences and other "things of the mind," along with verified facts and lessons of history, and so on, providing, of course, they are not in conflict with science). I described the new macro-mental outlook as being "unifying," but the reference was to past philosophic and other paradoxical, antipodal dichotomies. This description was not meant to suggest a "unification" of religion and science as one and the same.

Errors such as the foregoing reflect in part a mistaken conception of what is at issue. This is further evident in the assumptions that the new outlook (1) illustrates "ways in which current neuroscientific findings push us past the reductive materialism of prior physical science" (Jones 1992, 190); (2) is derived "on the basis of

neuroscience" (190); or (3) has "its foundation in contemporary research" (190). None of these really applies to the paradigm turnaround I describe. They indicate a misconception from the start that renders the great bulk of the criticism inapplicable.

A Modified Concept of Causal Determinism

The things at issue in my account, such as physicalism versus mentalism, reductionism versus holism, dualism versus monism, emergence, and so on, do not rest solely on neurological or other scientific findings. Resolutions have been proposed since long before neuroscience, or even science, existed. My described switch from behaviorism to mentalism involved a diametric turnabout in the conception and treatment of mental states, shifting consciousness from a prior noncausal to a new, causally interactive functional role. This was impelled, not by new scientific findings, but by discovery of a new model of causal determinism. Although this conceptual breakthrough happened to have been prompted by the split-brain/split-mind findings and gives better explanations of these findings, the basic key factor behind the change was the new concept of causal explanation.

The traditional below-upward microdeterminism of the behaviorist-materialist era was displaced by a new mentalist or "macro-mental" model, wherein classic bottom-up microdeterminism is supplemented with nonreductive emergent and top-down, supervenient control. Like the behaviorism it replaces, the new mentalist doctrine is not just a neurological theory of consciousness but an overriding *meta*theory or world-view paradigm (Hein 1969; Kuhn 1970; Reese and Overton 1972). The absence of this important distinction is further evident in Jones's title, introduction, and all through the section on "Crucial Experiments."

Approaches to the mind-brain problem have long centered around two distinctly different types of question: (1) By what kinds of neural or biophysical processes is conscious experience generated? And (2) Is conscious experience (once generated and whatever it is) causal or noncausal? That is, do the contents and qualities of subjective experience *per se* exert a causal interactive influence in brain processing? It is this second question, not the first, to which my article relates. Whereas an answer to the first question might well need to incorporate the several types of "crucial" findings outlined, this hardly applies to the centuries-old causality question.

The long-standing assumption in science and philosophy that consciousness cannot possibly exert causal influence in the physical brain

or outside world ("mind does not move matter") was based on grounds that this would be in conflict with other demonstrated laws and principles of physics, including violation of the conservation of energy. Moreover, it has seemed increasingly apparent in actual practice that the causal explanatory systems of science have no need and no place in which to insert conscious mental or spiritual forces. It is this thinking that was reversed in the paradigm shift from longtime physicalism to our new mentalism. The new mentalist answer is thus based, not on new scientific findings, but on a modified logic for causal explanation. A different form of causal determinism is conceived that allows subjective qualities to play a causative role in brain function without violating the conservation of energy or related principles of physics.

In the new model, the chains of microcausation at neurocellular and other levels already dealt with in neuroscience are preserved intact, so there is no conflict in this area. These lower-level interactions, however, are seen to be embedded within, and thus controlled by, higher-level systems of cognitive processing such as a train of thought, the nature of which has yet to be understood or included in neuroscience. These unknown conscious levels of brain processing, however, are presumed to be subject to investigation pending development of adequate methods, including technology for showing the critical holistic pattern dynamics (Sperry 1969). The conflict, revolt, and overthrow are centered in the prior assumption that bottom-up microdeterminism provides in itself a *complete* and correct causal explanation.

Emergent Causation and Biofeedback Not the Same

Whereas my proposal is correctly described as being based on the "principle of emergent causation" (Jones 1992, 191), the essential nature of emergent causation is seriously misinterpreted when conventional examples of biofeedback are taken to be an illustration. The feedback principle is much older, did not have revisionary impact on reductionist/holist issues, and required no change in the conventional microdeterminist approach. While feedback is similar in being a type of double-way reciprocal control, the form of causality featured is quite different. Emergent causation primarily involves interlevel, concomitant upward and downward determinism. Feedback controls, on the other hand, typically feature in both directions the more commonly recognized sequential, one-level form of causation.

The entities within a feedback system, like any others, in them-

selves must involvê emergent causation, but one does not have to go to feedback concepts for illustration. As you look around, almost everything you see is an illustration: a pencil, a tree, any entity that has emergent macro properties, including, by this hypothesis, mental states which are taken to be another, but special, example of the ubiquitous emergent causality principle. References in my *Zygon* paper (see also 1991b) give and explain simple physical illustrations, such as the control of an embedded molecule in a rolling wheel, in organisms (in the process of swinging, flying, running), in an eddy in fluid flow, and in wave action, among many others. As Karl Popper concurs (Popper and Eccles 1977, 209), the principle seems obvious.

Opposing the microdeterministic view that things are fully explained atomistically from below upward, we posit that emergent (macro and mental) properties are real, irreducible, and causally interactive. They not only interact functionally at their own level, but also exert downward supervenient control over their micro components and the bottom-up atomistic causality. "A molecule in many respects is the master of its inner atoms and electrons. The latter are hauled and forced about in chemical interactions by the over-all configurational properties of the whole molecule" (Sperry 1964, 20). And in the brain,

> Even the brain cells . . . do not have very much to say about when they are going to fire their messages. . . . The firing orders for the day come from a higher command. . . . if one keeps climbing upward in the chain of command within the brain, one finds at the very top those over-all organizational forces and dynamic properties of the large patterns of cerebral excitation that are correlated with mental states. (Sperry 1965, 79–80)

The emergent mental states are at the same time reciprocally determined, as traditionally assumed, by the properties and organizational interrelations of their neuronal components (Sperry 1969). Thus, it is a concomitant, reciprocal, two-way control action, but it involves no conflict because the downward causation is of a quite different nature (enveloping, encompassing) from that of the internal upward determination of the whole by the parts. And the same applies to the parts acting as entities themselves, and the parts of the parts all through the hierarchic structure of any entity.

Confusion about what is meant exactly by emergent mental causation is further evidenced in the use of mental imagery healing and related psychosomatic effects as a demonstration. The existence of psychosomatic and related mind-control phenomena has long been recognized, but prior to the 1970s these phenomena were taken to be compatible with other, then-prevailing mind-brain solutions such

as epiphenomenalism or the mind-brain identity theory. Thus, they did not constitute an effective threat to behaviorist-materialist doctrine. Overthrow of the latter required that the contents of subjective experience be viewed as indispensable or "ineliminable" for a causal explanation of conscious experience. Thus far, emergent interaction with downward control is the one accepted concept we have for this.

Somewhat as elements within the chips of a computer may be activated in different sequences and time patterns by different software programs, the firing patterns of nerve cells in the brain correlate with, depend on, and are controlled by the schedule of mental activity, such as a train of thought. We assume neurocellular activity involved in a train of thought is controlled throughout by laws of physiology and biochemistry. At the same time, the more prominent programming features are controlled at the cognitive level by mental variables. Different frames of reference are involved; but more than this, two different types of causal control work concomitantly in determining the course of brain events.

Existing clues to the nature of the still-unknown mechanisms by which this is accomplished favor the idea that some kind of yet-to-be-discovered form of emergent (mental, cognitive) property of the cell-assembly dynamics interacts with other such cognitive emergents on a holistic or "functionalist" basis (Sperry 1952). What counts in the lawful progression of mentation is assumed to be the overall *functional* effect of the successive brain processes, each with its mental emergents interacting as wholes in a varying context of cerebral activity. The lower-level causality in neurocellular and other microevents is not interrupted, disrupted, or intervened with, but simply caught up in and enveloped (supervened) within the larger systems of coherent dynamics.

Emergent properties and laws all through nature are in general notorious for being novel and very different from those of their components, often surprisingly, unpredictably, and even mysteriously so. With much simpler cases yet lacking any "theoretical bridge" (Jones 1992, 196), it is not expected that the emergent mental properties should now be conceivable in terms of their still unknown physiology. The problem in part is because the collective spacing and timing of the elements that make up the emergent pattern or form properties are in themselves a crucial part of the causal complex, and we have no adequate science or laws as yet for these spacing and timing "form" factors. That the qualities of subjective experience can be built from the dynamics of brain processing is thus not at all an unreasonable assumption.

Overall Assessment

Additional misleading impressions in this critique include references to the macro-mental theory as a "systems" model (196) (see Sperry 1991b) and the assumption that it rests in a mind-brain identity view wherein "consciousness is a system of neurons" (195). I have emphasized from the start that the emergent subjective mental element of conscious experience is "more than and different from" that of its physiological components, that the difference between the two is that between an emergent property and its infrastructure (Sperry 1969, 1976, 175). The conscious property is inseparable from its infrastructure but not identical to it, and the same conscious effect may be obtained presumably with different infrastructures given changes in the contextual dynamics (Sperry 1952).

There remain a number of other more subtle problems one can point to that may mislead generalist readers, such as mix-ups in historical background, and some of the philosophic issues raised could, of course, be argued endlessly. Overall, I believe the main point to be made in answer to Jones's collective concerns appears to be that several basic major misconceptions render the resultant arguments, in the main, inapplicable. The critique in general is aimed at a wrong target.

In retrospect, it is worth noting further that Jones's case is bolstered throughout by citing various personal opinions in the philosophy of consciousness, such as that of Eccles, Penfield, Hofstadter and Dennett, Nagel, Robinson, and so on. By contrast, the position I support is founded in what has become the accepted working mentalist doctrine of the whole discipline of behavioral science, reflecting the latest collective majority judgment of that discipline which specializes in mind and behavior. It is thus based, not just in philosophy, but also in a documented historical development in science that has lasted and grown over some two decades (Baars 1986; Gardner 1985; Sperry 1987). Further, the underlying new key concept, a modified paradigm for causal explanation, has in the meantime been gaining additional ground in other disciplines, including philosophy (Bunge 1977; Grene 1988; Rottschaefer 1991) and epistemology in general, with strong indications today that this is turning into a major revolution for all science, not just behavioral science.

The final answer, however, is certainly not yet in on consciousness or on the whole mind-matter issue, and Jones's questioning of the validity of any argument based on some assumed answer is justified. At the same time, however, the nature of consciousness is such, and

our assumptions with respect to it are so inevitably woven into our behavior that, as Penfield (1975) pointed out, and myself also (Sperry 1965), we cannot wait for science to provide the final answer but have to proceed with the best we have. At present the best answer we have appears to me to be the macromental model based in the collective judgment of specialists making appraisals from all different angles.

In a later section Jones describes three forms of "inherent incompleteness" said to apply to all human theorizing and any reasoned proposal (including, presumably, Jones's own reasoning about "inherent incompleteness"?). The logic of reasoned theorizing according to the Gödel form of incompleteness cannot validate all starting assumptions on which it rests. This, nevertheless, leaves human reasoning and theorizing highly reliable provided they are based on correct starting assumptions, whereas false conclusions naturally follow if, as above, reasoning starts on erroneous assumptions. My own case is framed in practical, pragmatic terms where the starting assumptions are assumed to be traceable to a sound foundation in the coevolution of an integrated mind-brain-world reality.

Another closely related form of incompleteness is implied which involves the claim that a mind-brain system may not logically—paradoxically—provide a complete account of its mind-brain system. As I understand it, this reasoning does not apply, however, to objective accounts of other conscious minds of the same or other species (Sperry 1965, 83). This and the contention that "all theories are incomplete in several senses," which applies to the theories of Einstein, Darwin, and everyone else, when viewed from a pragmatic problem-oriented framework, seem not to have been of much consequence in the real world of causal interaction, or to have held back the real progress of science.

In an important final criticism, Jones takes issue with some statements in my concluding paragraphs. He contends that our ultimate beliefs need to be based on more than what is caught in the net of current mainstream science. This point, I believe, is certainly well taken, and I could not agree more. My statement, for example, that "mental telepathy, all occultisms . . . and anything else not accepted in mainstream science are ruled out" would mean ruling out, of course, many things that I already have just claimed should be included. This section was a late addition to the manuscript and should have been phrased more carefully. Instead of "not accepted in," for example, it would have been more accurate to say, "anything contradicted by." It seems our respective positions overall may actually have much more in common than appears—especially when Jones explains (200) that he has "no desire to . . . suggest that

religions can or should believe propositions directly contradicted by science."

Balancing Strengths and Weaknesses: A Pragmatic Reflection

The described science-consistent belief system has obvious strengths, such as credibility, a culture-free and nonexclusive universality (Toynbee and Ikeda 1976), and intrinsic "save-the-planet," "sustainable world" potential. It provides a biocentric ethicomoral code with transcendent long-range global priorities and suggests criteria for a supreme plan for existence on planet Earth. In respect to today's worsening environmental crisis and rising threats to survival, it promotes values of a kind that would act to preserve and enhance the enduring quality of the biosphere, and it describes a conceptually defined solution to a way out of today's global predicament via a reordering in social value priorities. The latter has come to be widely recognized as a requisite key step (e.g., Berry 1988; Brown 1981; Sperry 1972; White 1967). Once these driving new values and social mind-sets are in place, the rest will follow.

At the same time, however, such a science-consistent system of belief has some obvious shortcomings that naturally tend to deter any ready acceptance. These appear mainly in respect to satisfying spiritual and emotional needs as fulfilled by orthodox faiths that have an all-powerful, personal, and caring Deity, who is omniscient, rules with higher purpose, determines ultimate moral justice, and promises eternal, conscious afterlife in another realm of existence—or continuing reincarnations in this world. In particular, a continuation of conscious experience following brain death seems to be definitely excluded by modern mind-brain neuroscience and our going concept of consciousness as an inseparable dynamic property of the living, functioning brain.

In an earlier, brief discussion of this and related problems (Sperry 1983), I was convinced that an improved, more wise and sophisticated interpretation of existence and its meaning in terms of the new paradigm might succeed in dispelling, through a higher level of understanding, the natural human desire for continuing afterlife. Among other considerations, the new outlook in science does allow for the highest level of the conscious self to be preserved beyond brain death in the sense that the crowning best of Beethoven, Raphael, Michelangelo, Darwin, Einstein, and so on are still with us, and the same principle applies in other respects and modes to all of us.

It seemed possible also that a role in fulfilling various other

emotional, spiritual, and life-meaning needs might be preserved in large part through an updated reinterpretation of the creative cosmic forces that control the universe and created humankind, by viewing these forces in terms of evolving nature, including human nature, within the realistic framework of the new paradigm. New, greater emphasis on the creative role of parents, family, mentors, and actual sociocultural factors is one example. Such factors would all be reinforced, not only by the reinterpretations, but also by supportive institutional and other concordant societal reforms.

In some ways, a spiritual sense of higher meaning might even become intensified in beliefs that recenter the sacred in an immediate visible presence. So far as we currently know, the nearest thing to a heaven is not out there somewhere in the violent and desolate immensities of outer space (Friedman 1991). Advances in astrophysics and cosmology seem increasingly to indicate that the place to look could be right here on planet Earth. How transcendent and heavenly our planet is depends now on what we and coming generations make of it. In the described outlook, higher meaning might continue to be viewed over eternal or at least in long-range evolutionary perspectives. These must also include an open-ended future that allows for unlimited utopian possibilities, such as outer-space travel at immense speeds, controlling the aging process, higher dimensions of computer-enhanced experience, and endless other yet-undreamed, even unimaginable developments. Just as in the early galaxies there could be no concept of the kind of existence we enjoy today, we also can have no comprehension of the dimensions of existence that might lie ahead. Personal satisfaction and a sense of higher meaning may, for the present, be found in being an immediate part of and contributing to the creative cosmic venture in infinitely different ways.

The ultimate disaster from the standpoint of such an outlook, but not necessarily in fundamentalist religion, would be to lose it all through massive global extinction, thus sinking millennia of hard-won creative advance back into oblivion and cosmic meaninglessness. To avoid this becomes *the* overriding imperative of our times: morally, intellectually, and most other ways (e.g., Kaufman 1985; Starr 1984). This imperative, of necessity, frames the context for any present-day assessment of an ultimate worldview and value-belief system. Assuming that high-quality sustainable survival will require radically revised social value priorities to live and govern by, and that a value-belief system along the described lines might, as claimed, be the key to such change, it follows that anything that might speed its acceptance could make the difference for humankind

between quality survival and cosmic obliteration.

Vital emotional fulfillment conveyed by an established religion may be seen to derive not only from the conceptual doctrine as such, but also in considerable part from an accompanying more tangible, this-world surround that builds up over time in associated ritual, music, scripture, hymns, prayer, edifices, and so on, along with personal and social involvements. The process of acquiring such a supportive surround for a new belief system could be greatly speeded today by deliberate measures—starting with simple things such as paraphrasing old familiar hymns and prayers, composing new ones and the like—and otherwise building the new surround, using when possible the aid of modern media.

Looming confrontations between pro-life and pro-choice, pro-development versus pro-environment, and a host of other issues not faced in the past in which immediate human needs must increasingly be weighed against those of future generations and a viable ecosystem will call for a change in ultimate guidelines of right and wrong. These coming hard choices will mean personal sacrifices involving jobs, life-styles, foregoing additional children, lucrative development profits, and so on in favor of wilderness, endangered species, and other long-range environmentalist values. Decisions of this sort might come more easily, effectively, and rapidly if the new priorities could be seen to be upheld in a changed sense of the sacred and otherwise backed by deep, powerful religious convictions.

When we consider the inbuilt momentum in population growth and its side effects, the time factor may already be such that only through the power of an impassioned, religiouslike zeal and fervor can the required turnaround can be achieved in time. The point of no return seems already passed for leaving to the next generation an environment it justly deserves, equal in quality to that we inherited. In any case, the outlook logic seems simple and inescapable: The sooner the requisite reforms in values, life-styles, goals, and the like can be effected, the better the residual quality of the biosphere we hand on to succeeding generations—and thereby the better the hope that we ourselves may not lose the accumulated millennia of meaningfulness we see in our own generation.

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Editorial

What is the primary challenge that the sciences pose to religion and theology? For many persons in our Western society (presumably not those who read this journal), the issue is whether science "proves" religion to be true or false. As simplistic as this view appears, it may indeed be more widespread in the public mind than we want to admit. In an alternative view science challenges religious thinking to take account of scientific understandings and interpret them in a useful manner. When the challenge is put in these terms, our attention focuses on how science addresses theology rather than religion. Theology is the theoretical component of religion; its ideas and concepts seek to interpret the richness of religion's concrete elements in a coherent fashion.

Under certain circumstances, science does bid fair to "falsify" theological concepts (the inverted commas are intentional, since I am speaking loosely about a complex matter): when those concepts are inconsistent with the data that the sciences have discovered and with the understandings of the world that have been achieved through scientific consensus. Beyond this "falsification" function, however, and more significantly, science puts pressure on theological theories by its inherent demands that theological thought not only take into account the scientific understandings of the world but also interpret them in useful and fruitful ways.

These three elements may be placed on a continuum that ascends in importance as it unfolds. Taking scientific understandings into account is a more profound exercise for theology than simply to avoid falsification. Doing something with the scientific understandings—providing fruitful interpretations of them—is profounder yet and by far the greatest contribution theology can make to advance human life. It follows that theology must place emphasis on the concepts, the theories and models, currently employed in comprehending our world; only by doing so can theology provide the new interpretations by which human beings can make sense of their lives and shape their actions. Conversely, when theology fails to provide such fruitful concepts, baleful consequences too often ensue.

From its beginning, *Zygon* has considered these elements of the interaction between science and theology to be at the heart of its concerns. Its editors and authors over the years have taken for granted that theology aims to be consistent with scientific understandings, and the journal has focused on theology's efforts to take science into account and interpret its knowledge. The articles in this issue could not be more forceful in their concentration on the adequacy of concepts for integrating and interpreting scientific findings.

In June 1991, we published Roger Sperry's article "Beliefs to Live by Consistent with Science," to which James Jones responded critically in a piece entitled "Can Neuroscience Provide a Complete Account of Human Nature?" (June 1992). In the first article in this issue, Sperry argues that Jones obscured the central point of the original article. In the process,

Sperry walks the reader through an eminently lucid account of the logic and significance of his proposal for a nonreductive "macro-mental" theory of causation that is able to take into account the causal significance of the "ineliminable" contents of subjective experience, including experience that the humanities focus upon in their work. Sperry emphasizes that this theory constitutes a breakthrough, not in the discovery of any new facts, but in proposing a new model, "an overriding *meta*theory or worldview paradigm," that shifts consciousness "from a prior noncausal to a new causally interactive functional role." He reiterates an argument that he has made for some years now, that this new metatheory, by joining the world of science and that of the humanities "in a consistent and unbroken epistemologic continuum" enables theological theories to relate to the sciences in new ways. His metatheory also suggests new frameworks for understanding the importance and function of values in human life—a matter of great import for religion, insofar as it is concerned with values.

Lindon Eaves and Lora Gross draw attention to the failure of theological concepts to consider the knowledge that has emerged from the field of genetics. There is perhaps no other field of scientific research that theologians have handled so ineptly. However, Eaves and Gross devote most of their effort to the constructive task of suggesting how theological concepts can not only take genetic knowledge into account but interpret it in creative ways: they suggest that the concept of Spirit holds great promise in this effort.

Ward Goodenough, like Roger Sperry, offers work at the level of metatheory in his observation that, although traditional Western religions find theological theory to be a necessity for their adherents, other types of religion feel no such need. The encounter with science makes a different impact on this latter type of religion, because they need not work out the implications of science for a concept of God.

Empirical theology is the subject of Karl Peters's contribution to these pages. This school of thought flourished in the United States in the 1930s, 1940s, and 1950s, particularly at the Divinity School of the University of Chicago. In the person of one of its chief proponents, Henry Nelson Wieman, it had great influence on this journal's founder, Ralph Wendell Burhoe. During the years 1966 to 1969, Wieman published five articles in *Zygon*. Karl Peters has emerged as one of a number of thinkers who carry this mode of theological thinking forward today with a level of intensity that may even surpass its heyday a half-century ago. Peters's article underscores the conceptual task of theology, and he describes in helpful ways how empirical theology has developed a methodology that enables it to construct concepts that are especially adapted to the task of integrating scientific understandings.

Philip Hefner's piece also reflects upon the adequacy of theological concepts for understanding the world and human behavior in it. The specific conceptual field for his scrutiny is nature and the relationship of humans to it. His discussion concludes that in order to achieve greater adequacy, theological thought must conceptualize nature as the primary reality for both God and humans and must view human being as part of that nature. Furthermore, it must provide theoretical undergirding for the idea that human purpose is to enhance nature and involves the discernment of ultimacy as an intrinsic dimension of nature. Hefner's work reinforces an effort that is prominent in all of the articles in this issue, to construct

theological concepts that speak of ultimacy in terms that are nondualistic, imaging transcendence within the natural order and not separate from it.

The juxtaposition of the pieces by Peters and Hefner brings to the fore another consideration that is relevant to theology's task of forming more adequate concepts. These authors represent two types of theology, approaching the interaction with science in differing ways. These two types are empirical or naturalistic theology (Peters) and traditional theology (Hefner). In the months ahead, *Zygon* will have occasion to reflect at greater depth on these two approaches. The naturalistic approach, as Peters explains, holds the traditional symbols and doctrines of religion in abeyance as it attempts to discern as accurately as possible the reality of nature and of human beings within the natural world. The wager carried by this theological approach is that such discernment will disclose the dimensions of ultimacy and value that have always been at the heart of the religious vision. By bracketing out, at least provisionally, the traditional ways of symbolizing this dimension, naturalistic theology hopes to gain a clearer sense of how persons may actually encounter ultimacy and value in the contemporary situations of life, and how that dimension is embodied in scientific descriptions of the world. This type of theology is essential to the program of *Zygon* in that it acknowledges how scientific knowledge has destabilized older symbol systems and how seriously we must struggle to form new systems for understanding ultimacy and value.

Traditional theology, beginning with the received symbols and rituals, proceeds on a case-by-case basis to test their adequacy as vehicles of human discernment of ultimacy and value and explores the ways in which they may be reshaped or reinterpreted. It acknowledges also the possibility that some symbols from the past will simply fail the test of adequacy for illumining contemporary life. This traditional approach also stands within this journal's programmatic, in its dual concern for the inherent wisdom of ancient religious traditions and also the necessity of testing those traditions for contemporary adequacy.

This effort to integrate contemporary empirical adequacy with the wisdom of tradition figures with special intensity in Ingrid Shafer's poem "Noogenesis: Weaving Ourselves on Incarnation's Loom." At the very least, her poem is a *tour de force* that requires the reader's intense involvement. What she has attempted is to reflect upon how the multifaceted picture of nature provided by contemporary science reverberates in the mind of a person who is deeply conversant with the tradition of Western religion, philosophy, and literature. The complexities of the poem reflect the complexity of our Western humanistic and religious journey through the centuries. Set against the background of Roger Sperry's discussion, Shafer is testing in detail the "consistent and unbroken epistemologic continuum" that Sperry insists upon. Her predisposition is to find as much continuity as possible, to show the reader not only that much more of the Western tradition is consistent with the contemporary scientific understanding of things than we normally grant, but that this inner coherence reaches beyond the West to Vedantic, Buddhist, and Taoist notions. Her wager is that Sperry's metatheory can be a useful interpretive key to understanding our larger cultural past.

—Philip Hefner